THE TELEGRAPHIC JOURNAL AND ELECTRICAL REVIEW.

VOL. VIII.—No. 171.

PATENTS.

WE recollect reading, some years ago, in one of the works of the celebrated American humourist Artemus Ward, a description by the facetious author of a trial of some newly-invented artillery. The great point of novelty in one of these wonderful inventions consisted in the fact that the carriage of the piece was painted of a bright red, instead of the usual regulation colour. In looking at the plentiful crop of patents that are published weekly, we cannot but be reminded of the above anecdote, though we would not go so far as to say that the improvements for which patents are taken out are often as slight or as ridiculous as in the case in point. At the same time, however, the improvements, which are considered as such, and which are made the subjects of a patent, are often so slight that the sum expended in protecting the same can hardly be regarded as other than thrown away. Since the telephonic and electric-light rage set in, the coffers of the patent authorities have received a considerable accession of coin from this source alone, and a careful examination of the whole list of patents taken out on the two subjects certainly does not give one an impression that common sense has in all cases been the guiding spirit. It would be invidious to mention any special cases, but that such exist there can be no doubt.

By speculation is usually understood an investment in shares on the chance of a rise in their value, but we are inclined to think that the term is equally applicable to patents. A patent is practically an investment, and, in many cases, it is purely a speculative one, the liability being, however, limited, and the amount invested small, but still the amount, although small, is often more than the inventor can afford, and might be saved if care was taken not to rush to the patent agent unless the ideas devised are something more than different ways of effecting an already accomplished object, which a very large number of inventions are in reality. To a certain extent, the expense of a patent acts as a check upon indiscriminate protection, and, for this reason, a change in their cost may not be desirable. A change in the laws governing the administration of the Patent Office is, however, much to be wished for, and will no doubt be effected at some future date, for the present, however, the question has been unavoidably shelved.

ON THE DYNAMO-ELECTRIC CURRENT AND ON CERTAIN MEANS TO IMPROVE ITS STEADINESS.

By C. WILLIAM SIEMENS, D.C.L., F.R.S.*

THE author, after alluding to the early conception by Dr. Werner Siemens of the dynamo-electric or accumulative principle of generating currents, makes reference to the two papers on the subject presented, the one by Sir Charles Wheatstone and the other by himself, to the Royal Society in February, 1867. The machine then designed by him, and shown in operation on that occasion, is again brought forward with a view of indicating the progress that has since taken place in the construction of dynamo-electrical machines, particularly those by Gramme and Siemens von Alteneck. The paper next points out certain drawbacks to the use of these machines, both of them being subject to the disadvantage that an increase of external resistance causes a falling off of the current; and that, on the other hand, the short circuiting of the outer resistance, through contact between the carbon electrodes of an electric lamp, very much increases the electric excitement of the machine, and the power necessary to maintain its motion, giving rise to rapid heating and destructive sparks in the machine itself.

An observation in Sir Charles Wheatstone's paper is referred to, pointing to the fact that a powerful current is set up in the shunt circuit of a dynamo-electric-machine, which circumstance has since been taken advantage of to some extent by Mr. Ladd and Mr. Brush, in constructing current generators.

The principal object of the paper is to establish the conditions under which dynamo-electric machines, worked on the shunt principle, can be made to give maximum results. A series of tables and diagrams are given, the results of experiments conducted by Mr. Lanckert, electrician, employed at the author's works, which lead up to the conclusion that, in constructing such machines on the shunt principle, the resistance on the rotating helix has to be considerably reduced by increasing the thickness of the wire employed, and the resistance on the magnets has to be increased more than tenfold, not by the employment of thin wire, but by augmenting the length and weight of coil wire employed.

The results of this mode of distributing the resistances is summarised as follows:—

1. That the electro-motive force, instead of diminishing with increased resistance, increases at first rapidly, and then more slowly towards an asymptote.

2. That the current in the outer circuit is actually greater for a unit and a half resistance than for one unit.

3. With an external resistance of one unit, which is about equivalent to an electric arc, when thirty or

* Proceedings of the Royal Society.

forty webers are passing through it, 2·44 horse-power is expended, of which 1·29 horse-power is usefully employed, proving an efficiency of 53 per cent., as compared with 45 per cent. in the case of the ordinary dynamo machine.

4. That the maximum energy which can be demanded from the engine is 2·6 horse-power, so that but a small margin of power is needed to suffice for the greatest possible requirement.

5. That the maximum energy which can be injuriously transferred into heat in the machine itself is 1·3 horse-power, so that there is no fear here of destroying the insulation of the helix by excessive heating.

6. That the maximum current is approximately that which would be habitually used, and which the commutator and collecting brushes are quite capable of transmitting.

Hence the author concludes that the new machine will give a steadier light than the old one

FIG. 1

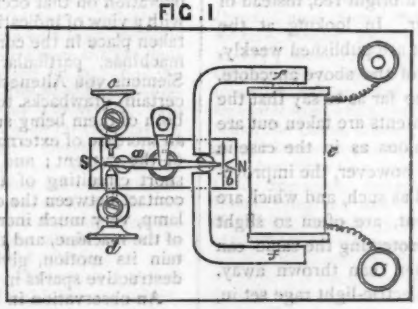
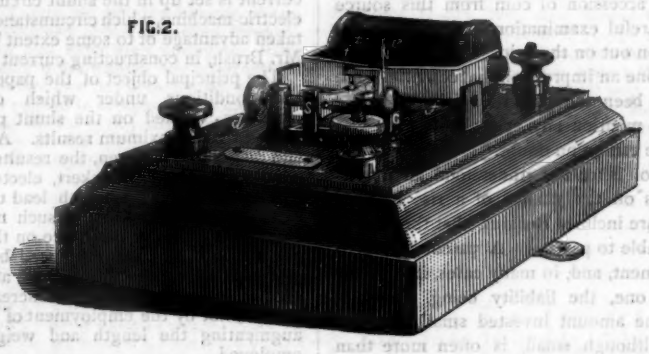


FIG. 2.



with greater average economy of power, that it will be less liable to derangement, and may be driven without variation of speed by a smaller engine; also that the new machine is free from all objection when used for the purpose of electro deposition.

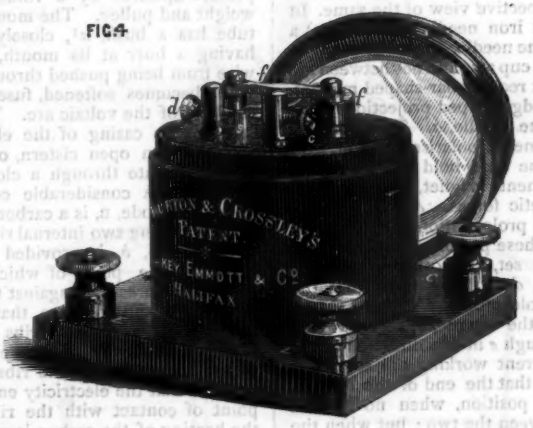
This construction of the machine enables the author to effect an important simplification of the regulator to work electric lamps, enabling him to dispense with all wheel and clockwork in the arrangement. The two carbons, being pushed onward by gravity or spring power, are checked laterally by a pointed metallic abutment situated at such a distance from the arc itself that the heat is only just sufficient to cause the gradual wasting away of the carbon in contact with atmospheric air. The carbon holders are connected to the iron core of a solenoid coil, of a resistance equal to about fifty times that of the arc, the ends of which coil are connected to the two electrodes respectively. The weight of the core (which may be varied), determines the force of current that has to pass through the regulating coil in order to keep the weight in suspension, and this in its turn is dependent upon the resistance of the arc. The result is that the length of the arc is regulated automatically, so as to maintain a uniform resistance signifying a uniform development of light.

WARBURTON AND CROSSLEY'S RELAY.

THIS invention forms the subject of a joint patent by Mr. E. C. Warburton, telegraph engineer and superintendent to the Lancashire and Yorkshire Railway Company, of Manchester, and Mr. Louis John Crossley, of Dean Clough, Halifax, the inventor of the Telephonic Transmitter, described and illustrated in our issue of the 1st May, 1879. The object of the invention is the sensitisation and simplification of polarised relays generally, whether used for single or double current working. These improved relays may be used with advantage in the place of the ordinary soft iron relays, since, unlike the latter, they are devoid of adjusting springs. The invention is particularly applicable to the double relay employed with the Bright's Bell In-

FIG. 3

FIG. 4



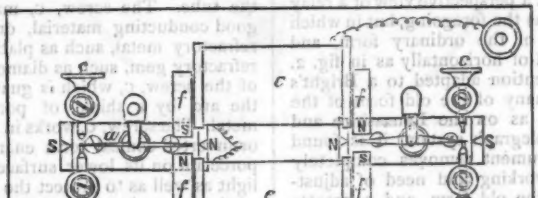


FIG. 5.

strument,[*] as it renders this form of relay very easy of adjustment, and, moreover, it does away with its liability to become demagnetised.

The Bright's Bell Instrument has been used with much success in the Lancashire and Yorkshire Railway Company's telegraph department since 1870 on their important circuits, and it has been frequently shown that this form of instrument, with a given quantity of wires and clerks, enables a greater amount of work to be got through than would be possible by means of the single needle (visual) instruments or single sounder (audible) instruments. It is well known that the Bright's Bell Instrument has a working capacity of forty and forty-five words per minute in ordinary message work, the receiving clerk writing for himself, and it has, therefore, appeared desirable to Mr. Warburton to remove the recognised defects of so desirable an instrument, and to increase its usefulness even in less skilled hands. The present invention is the successful result of experimental efforts to the foregoing end.

Figs. 1, 2, and 3 will make clear the nature of the invention. Fig. 1 shows a plan of one form of the relay, and fig. 2 a perspective view of the same. In these figs. *a* is a soft iron needle and *b* (fig. 1) a permanent magnet. The needle, *a*, is mounted at its centre upon a point and cup axis and lies between the poles of the permanent rectangular-shaped magnet, *b* (fig. 1), which has wedge-shaped projections, N, S, opposite the ends of the needle, *a*. These projections being highly magnetic, polarise the soft iron needle, and, at the same time, hold it in a position parallel to the permanent magnet, when undisturbed by other magnetic forces. *e* is an electro-magnet and *f*, *f*, are prolongations of its poles. Between the ends of these prolongations one end of the tongue, *a*, is set, the other end plays between two stops, *c*, *d*. It is evident that the magnetisation of the pole pieces, *f f*, will cause a to and fro motion of the tongue, *a*, according as the current passes through *e* in one direction or the other. For double current working the screws, *c*, *d*, may be so adjusted that the end of the tongue, *a*, may, in its normal position, when no current passes, lie midway between the two; but when the relay is required for single current working, then the screw, *d*, must be screwed up till the tongue just banks against it in its normal position. Fig. 3 shows a plan and fig. 4 a perspective view of a relay on the same principle as the foregoing, but in which the electro-magnet is of the ordinary form, and fixed vertically instead of horizontally as in fig. 2. Fig. 5 shows the invention adapted to a Bright's Bell Relay. Where many of the old form of the latter are used, such as on the Lancashire and Yorkshire Railway telegraph system, it is found that a converted instrument removes completely the irregularities of working and need of adjustment so common to the old form, and a greater despatch of business and saving of cost of maintenance results therefrom. The improved instruments are self-adjusting up to extreme limits of variation in the working currents; they are self-magnetising after being once charged in the workshop; and they are undemagnetisable by lightning. As regards sensitiveness, the relay will respond properly to a current of $\frac{1}{2}$ a milliweber, and also will respond properly to a current of 20 milliwebers or more without readjustment. Experiments have proved that the tongue responds promptly and accurately to the currents from a Wheatstone automatic transmitter going at a high rate of speed.

It has also been proved that in the same clerk's hands the relay will work on a defective circuit where a single needle instrument with the old form of Bright's Bell relay had become quite inoperative owing to reduced potential of current from weather influences.

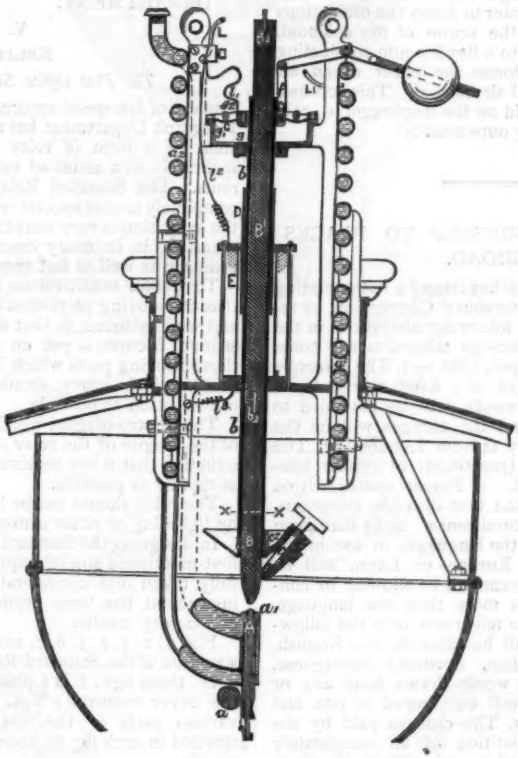
[*] Telegraphic Journal, February 15th, 1880, page 65.

SIEMENS' SINGLE CARBON ELECTRIC LAMP.

THE construction of this lamp, to which we referred in our last issue,[*] is as follows:—In the fig., which represents a vertical section of the lamp, A is the lower electrode, formed of an iron or steel wire loosely fitting in a water-cased tube, and pressed upwards by a volute spring, *a*, or by a weight and pulley. The mouth of the water-cased tube has a bush, a^1, closely fitting the wire A, or having a burr at its mouth, so as to prevent the wire from being pushed through it, except when its point becomes softened, fused, and dissipated by the heat of the voltaic arc. The water circulating through the casing of the electrode may flow to and from an open cistern, or it may, as shown in fig. 1, circulate through a closed coil of tube, a^2, presenting a considerable cooling surface. The upper electrode, B, is a carbon rod free to slide in a tube, *b*, having two internal ribs. At the lower end of the tube, *b*, is provided an oblique adjusting screw, C, the point of which bears against the carbon and presses it against the ribs on the opposite side of the tube, so that being in a manner clamped between these ribs and the screw, C, it cannot slide down. Moreover, from this pressure of the carbon against the ribs, *b*, close contact results, so that the electricity enters the carbon at its point of contact with the ribs, and consequently the heating of the carbon is confined mostly to the portion of it which projects below the tube. As the lower end of the carbon gradually wastes away from the point, C, the carbon gradually slides down the tube. The screw, C, may be of copper, as a good conducting material, or its point may be of refractory metal, such as platinum, or it may be a refractory gem, such as diamond, let into the point of the screw, C, which is guarded from the heat of the arc by a shield of porcelain or refractory metal. The screw, C, works in a shield, c^2, of convex or inverted conical form enamelled or faced with porcelain on its lower surface, so as to reflect the light as well as to protect the tube, *b*, from the heat of the arc. As the carbon, B, becomes consumed and descends down the tube, *b*, a fresh carbon, B^1, can be added to it; for this purpose the upper end of the one carbon is hollowed out a little, and the lower end of the fresh carbon is served with a little moistened sugar, or with tar, which, as the junction approaches the lower end of the tube, becomes carbonised by the heat, cementing the two carbons

[*] Stewart's Electric Lamp, page 80.

together. It is of advantage to provide in each carbon a short piece of wire, b^2, to act as a dowel, centering the carbons to one another; or the one carbon might be made with a point projecting as a tenon to enter a hole in the end of the other carbon. The automatic adjustment of the distance of the electrodes is effected in the following manner:—



SIEMENS' SINGLE CARBON ELECTRIC LAMP.

The tube, b, has on it, a cylindrical casing, D, of soft iron; or instead of a complete cylindrical casing, the iron may be put on the tube as a number of strips arranged round its circumference. Around the tube, b, is the coil of a solenoid, E, consisting of a great number of convolutions of insulated wire, so as to present very considerable electrical resistance. This solenoid coil forms part of a circuit connecting the one terminal with the other, as will be understood by tracing the course of the electrical current from the one line wire, L, to the other line wire, L^1. The one wire, L, is attached to an insulated connecting piece, l, from which a flexible metallic strip, l^1, connects to the tube, b, holding the upper carbon, and a wire, l^2, connects to the solenoid coil, E. The other wire, L^1, is connected directly to the frame of the lamp, which is all in metallic connection with the lower terminals, and also by a wire, l^3, with the solenoid coil, E. The tube, b, and its carbon being a little more than counterbalanced by an adjustable weight on a lever connected to the tube by a non-conducting link, f, the regulation of the distance of the terminals depends upon the

relative quantities of electricity passing through the voltaic arc between them and through the solenoid, E. When the terminals are too near each other, very little of the electricity passes through the solenoid, and the counterweight then draws the terminals apart; when they are too far apart a larger portion of the electricity passes through the solenoid, E, the iron, D, is thereby attracted down into the solenoid, and the terminals are thus brought nearer together. Should the lamp be extinguished so that there is no passage of electricity from the one terminal to the other, then the whole of the current passes through the solenoid, and the terminals being thus brought close together, the arc is re-established. In order to damp the oscillations that might result from the action of the solenoid, the tube, *b*, is attached to a flexible non-conducting diaphragm, G, which forms the cover of an air vessel, *g*, having a small air hole, g^1. This acts as a dash-pot, a ring, g^2, laid on the diaphragm, G, preventing it from bulging outwards.

TELEGRAMS ADDRESSED TO PLACES ABROAD.

THE Postmaster-General has issued a notice stating that under the St. Petersburg Convention, as revised in London, the following alterations in the regulations respecting foreign telegrams will come into force on the 1st April, 1880:—1. The principle of a word tariff, instead of a fixed charge for a minimum number of words, will be extended to European telegrams, and the charges will be the same from the country as from London. 2. The compulsory collation (repetition) of cypher telegrams will be abolished. 3. Proper names will no longer be allowed in the text of code telegrams, unless used in their natural sense. 4. In European code telegrams any of the languages in use in the different countries of Europe, or Latin, will be allowed; but no telegram will be allowed to contain words drawn from more than one language. In extra-European code telegrams, only the following eight languages will be allowed, viz., English, French, German, Italian, Spanish, Portuguese, Dutch, and Latin; but words drawn from any or all of these languages will be allowed in one and the same telegram. 5. The charges paid by the addressee for the repetition of an inaccurately transmitted telegram will be refunded. 6. Numbers written in words will be counted according to the manner in which they are written by the sender. For example, "Two hundred and thirty-four" would be counted as five words; but "Twohundredandthirtyfour" as two words in European telegrams (fifteen letters to a word), and three words in extra-European telegrams (ten letters to a word). 7. In extra-European telegrams, groups of figures or letters will be counted at the rate of three (instead of five) to a word. 8. The length of the reply to a telegram which can be prepaid by the sender will be limited to thirty words, and a form will be handed to the addressee enabling him to send a reply at any time within six weeks. Should the addressee not use the form, the amount paid for the reply will be returned to the sender, provided that the addressee returns the form within six weeks to the Post Office, accompanied by a request that the money may be refunded to the sender. In no case will the amount be paid to the addressee. 9. The charge for each copy (after the first) of a telegram containing a multiple address will be reduced from 5d. per copy of twenty words to 5d. per copy of one hundred words.

TELEGRAPHIC APPARATUS IN USE IN THE BRITISH POSTAL TELEGRAPH DEPARTMENT.

V.

RELAYS.

The Post Office Standard Relay.

THE use of fast speed apparatus in the British Postal Telegraph Department has necessitated the employment of a form of relay which would respond accurately to a series of very rapidly reversed currents. The Standard Relay now in use answers completely to this special requirement, and being at the same time a very sensitive instrument and easily adjusted, is in many cases used for working on ordinary as well as fast speed circuits.

To obtain sensitiveness in a relay, it is essential that the moving parts should be as light as possible, and well balanced, so that no undue drag, and consequent friction, is put on the pivots of the same; those moving parts which it is essential should be comparatively heavy, should be set as near the axis of oscillation as possible.

The electro-magnet which causes the movement of the tongue of the relay should be of such a construction that it can receive and lose its magnetism as rapidly as possible.

The relay should not be liable to demagnetisation by lightning or other causes.

In designing the Standard Relay, all these, and the first-mentioned special requirement, have been carefully taken into consideration, so that a first-class instrument has been produced which gives most satisfactory results.

Figs 1, 2, 3, 4, 5, 6, 7, and 8 will enable the construction of the Standard Relay to be understood.

Of these figs., 1 is a plan of the instrument with the cover removed; figs. 2, 3, 4, 5, and 6 show various parts of the instrument, portions being omitted in each fig. to show the other parts more clearly.

Referring to fig. 4, which represents the armature of the relay, and referring also to the other figs., *a* is a brass rod, with steel pivots at each end; t_1 and t_2 are soft iron tongues fixed to *a*, and *t* is a thin brass tongue with a platinum contact piece, *c*, at its end. A thin spiral copper wire, *z*, has one end screwed to *a*, the other end being connected with the frame of the instrument so as to ensure good contact being made between the armature and the frame. The top pivot of the armature turns in the brass bridge, *b*, *b*, and the lower part turns in a hole on the brass bed plate, P_1, P_1; the end of the pivot, which is highly burnished, rests on a small polished steel plate, *v*. It is very essential that the lower pivoting should be done in this manner; if the shoulder of the pivot rested on the bed-plate, the

FIG. 1

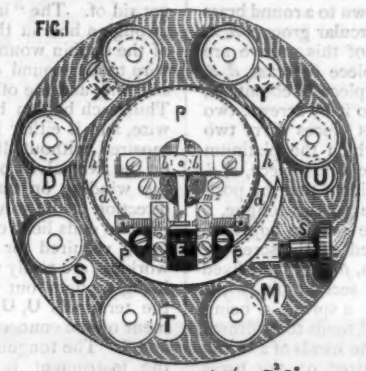


FIG. 2

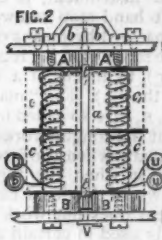


FIG. 3

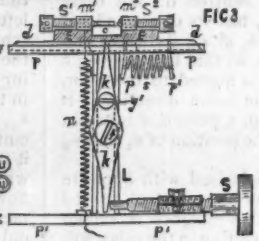


FIG. 4

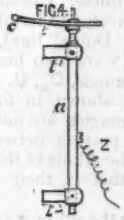


FIG. 5

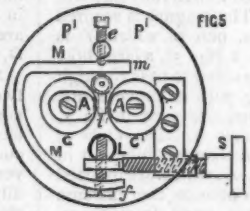


FIG. 6

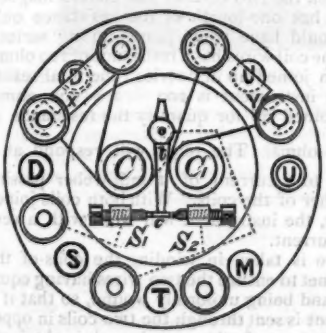


FIG. 7.

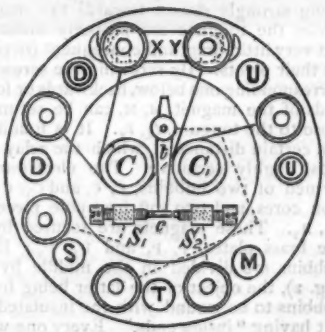


FIG. 8.

sensitiveness of the relay would be very greatly diminished.

The bridge, *b*, *b*, is screwed down to a round brass plate, P, P; this plate has a circular groove, *h*, *h*, turned in its surface; the edges of this groove are undercut V shape; a circular piece of brass, *d*, *d*, slides in this groove. To *d*, *d*, a piece of ebonite, E, is screwed, which has secured to it by screws, two brass pieces, m_1, m_2; these brass pieces carry two contact screws, s_1, s_2, between which the platinum contact, *c*, plays. By sliding the brass piece, *d*, *d*, round in the groove, *h*, *h*, it is evident that the position of the screws, s_1, s_2, relative to the tongue, *t*, and its contact piece, *c*, can be readily adjusted. The movement of *h*, *h*, is effected by the screw, S, in the following manner:—A pin, *p* (fig. 3), is fixed to the brass piece, *d*, *d*, and a second pin, p^1, is screwed to the brass plate, P, P; a spring, *s*, being hitched to *p* and p_1, the piece, *d*, *d*, tends to be drawn round in the direction in which the hands of a watch turn. A brass lever, *k*, *k*, centred on the brass pillar, L, L, by the screw, g^1, has its upper end set loosely in a hole in the piece, *d*, *d*; its lower end banks against the set screw, S, so that by screwing S forward, the upper end of *k* is moved to the right, thus moving *d*, *d*, round in the same direction. If S is unscrewed, then the spring, *s*, pulls *d*, *d* round in the reverse direction; thus the position of s_1 and s_2 can be finely adjusted.

The tongues, t_1, t_2, are polarised with opposite polarities by means of a permanent steel curved horseshoe magnet, M, M. This magnet is shown in perspective by fig. 6; its position in the relay will be understood from fig. 5. The magnet is secured in its place by three screws, one of which, *f*, is screwed into the brass pillar, L, L (fig. 3), a large hole being made in *k*, *k*, to allow the screw to pass through the latter without interfering with its movements. Of the other two screws, one, *e*, is seen in fig. 5, the other is immediately below it. The ends of these two screws rest in slight channels filed out in the magnet. The tongues, t_1, t_2, which are induced by the magnet, are not set opposite the extreme ends, *m*, but a short distance away from them, as seen in fig. 5. The reason of this is, that it is found that at a certain point away from the extreme ends, *m*, of the permanent magnet, magnetism is induced in the tongues, t_1, t_2, without the latter being strongly drawn towards the magnet; thus, whilst the tongues are properly induced, there is but very little drag, and consequent friction, exerted on their pivots. By screwing the screw, *e*, and the corresponding one below, backwards or forwards, the ends of the magnet, M, M, can be set more or less close to the tongues, t_1, t_2. It is found that there is a certain distance at which the relay is rendered most highly sensitive. The electro-magnets are formed of two bobbins, C, C, and C_1, C_1, with soft iron cores, and two soft iron pole pieces, A, B, and A_1, B_1. These magnets are secured by screws to the brass plates, P, P, and P_1, P_1. Each of the bobbins are divided in the middle by a division (fig. 2), the object of the latter being to enable the bobbins to be wound with the insulated wire without having "inside ends." Every one who has had to deal with electro-magnets knows the trouble that "inside ends" cause. If these ends are accidentally broken, the whole of the wire has to be unwound off the bobbin to get at them and repair the breakage. In winding bobbins provided with central divisions, this source of trouble is entirely got rid of. The "inside end" is first brought out through a hole in the central division, and one half of the bobbin wound with wire. The rest of the wire to be wound on is then connected to the inside end, and the other half of the bobbin filled up. Thus each bobbin has two "outside ends" to the wire, and if either is broken by accident it can be repaired without difficulty. In winding the wire on the two halves of the bobbin, care is taken that the winding on one half is done in the reverse direction to the winding on the other half, so that the two ends lie in opposite directions. The relays, being required for both "single" and "duplex" working, are really wound with two wires, the ends being brought out and respectively connected to the terminals U, U_0,* and D, D_0.* The arrangement of the connections will be seen from figs. 7 and 8. The tongue, *t*, that is to say, the frame of the instrument, is connected to terminal T, the left-hand stop screw, s_1, is connected to terminal S (spacing) by means of a small spiral of wire, *n*, and the screw stop, s_2, is connectedto terminal, M (marking), by means of a similar spiral wire (not shown in the fig.). The "marking" and "spacing" screws, s_1, s_2, are so called because in an ordinary local circuit the tongue works the local instrument, or makes it mark, when the former is over against the stop, s_1, whilst when the tongue is against s_2 no current flows in the local circuit, consequently the instrument does not work on "spaces." Terminal S is only used in certain cases, which will be explained in due course. The ends of the wires from the coils are connected to terminals, U, U_0 ("Up" line), and D, D_0 ("Down" line), in the manner shown.

X and Y are two brass straps which hinge on the two terminals, D_0, U. When these straps are in the position shown in fig. 8, then the coils of the electro-magnet are joined up in "series," so that a current passing between terminals, D and U_0, traverses the whole of the wire on the electro-magnets direct, that is, their whole total resistance is in circuit.

When the straps, X and Y, are in the position shown in fig. 7, the coils are joined up for "quantity," that is to say, the current passing between D and U_0 splits between the two coils of the electro-magnet, which thus has one-fourth of the resistance only which it would have when joined up in "series."

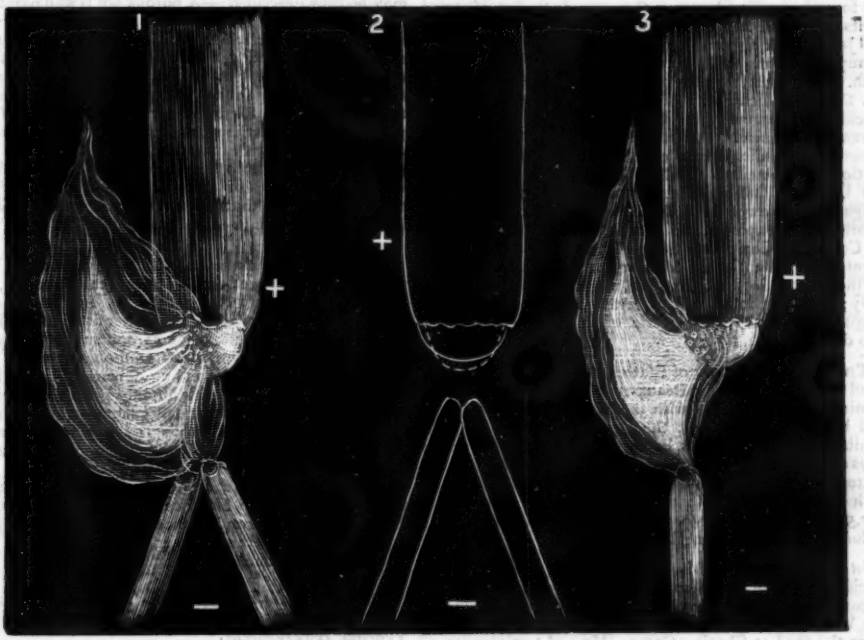
Each of the coil wires has a resistance of 200 ohms, so that when joined up in "series," the total resistance of the instrument is $200 \quad 2 = 400$ ohms, but when joined up for quantity the resistance is $\frac{200}{2} = 100$ ohms. The relay will respond at a high speed to a current of 1 milliweber passing through either of the coils. With both coils joined up in series, the instrument will work with a very much less current.

Great care is taken in winding the coils of the electro-magnet to ensure the two wires having equal resistances and being uniformly wound, so that if a strong current is sent through the two coils in opposite directions, a perfectly neutral result is obtained.

* U_0 and D_0 represent the terminals whose indicating letters have double circles round them.

CURIOUS VOLTAIC ARC EXPERIMENT.

WE lately had the pleasure of witnessing a curious experiment, made by Mr. J. Rapieff, with the electric-light arc in one of his three carbon lamps. The voltaic arc being started, the end of the upper, or +, carbon was touched with a piece of iron wire, which immediately melted, the molten portion clinging to the end of the carbon by capillary attraction. After a short time the carbon became cup-shaped at the bottom, the molten iron resting in the cup. On drawing out the arc, a curious phenomenon manifested itself, a cluster of small circles, or spots, presented themselves on the surface of the glistening metal, and flames radiated from them, which eventually lost themselves in the general flame. The drawings illustrate the effect in profile and nearly front view. The centre of the



flame was of a yellowish tinge, merging into a beautiful purple near the edges. On disconnecting the circuit and allowing the carbons to cool, the iron commenced a pulsatory movement up and down, as indicated by dotted line of figure 2, and eventually fell to the ground.

Notes.

THE Edison telephone has been put on a line 27 miles in length, between No. 7, Sauchiehall Street, Glasgow, and Grangemouth, both offices belonging to the Glasgow and Rotterdam Steam Shipping Company. The results obtained are said, by the *Glasgow Herald*, to have been extremely good.

THE telephone has been utilised by the Leeds Corporation for connecting the Town Hall with the waterworks and the gasworks at Eccup and New Wortley respectively.

THE use of an electric bell without special wire, as a means of call in a telephone circuit, is objectionable, and various attempts have been made to use the telephone itself for the purpose. In an arrangement recently contrived by Dr. Wurstenberger, of Stuttgart, the plate of the receiving telephone is made to give out loud sounds by means of an ordinary induction coil. The primary coil at either station is brought into the circuit of a local battery by means of a Morse key, or otherwise, and the secondary coils in both stations are simply inserted in the telephone circuit. So long as the key is in the position of rest, it closes a shorter secondary circuit than the secondary coil of the inductor, so that the telephone currents are not weakened by the resistance of the latter. But on depressing the key the battery is brought into the primary circuit of the inductor, and a series of induction currents sent into the telephone line. (A figure of the arrangement will be found in *Ding. Pol. Jo.*, 2nd Feb. number.)

A NEW USE FOR THE TELEPHONE.—Hitherto it has been a matter of some difficulty to determine the time of flight of small-arm projectiles, owing to the impossibility of seeing them strike. In a series of experiments made by the U. S. Ordnance Department, this difficulty has been overcome by the use of the telephone. The telephone was connected with two Blake transmitters, one placed near the gun, the other in front of and near the target. The time between the report of the gun and sound of the ball upon the target was measured by a stop-watch. The observations, founded on a large number of experiments, never differed more than a quarter or half of a second from each other, the slight delay in starting the watch being neutralised by

the delay in stopping it. It was found that the time of transit was affected by the wind, being shortened by a rear and lengthened by a head-wind.—*Scientific American.*

THE TELEPHONE ON THE TYNE.—It is proposed to open a telephone exchange on the Sandhill, radiating to all parts of Newcastle, Gateshead, Elswick, Tynemouth, North and South Shields, Jarrow, Northumberland, and the Tyne Docks, &c. The system will be connected with merchants' offices. A subscription of something like £15 per year will give a merchant all the necessary accommodation. It is also proposed to have during business hours hourly reports of the arrivals and sailings of vessels, and all other sorts of useful information of shipping movements in the lower part of the river.

AT the Hippodrome, 60 Jablochkoff lights have been hitherto used in conjunction with 20 Serrin regulators, the former supplied by three Gramme batteries of 20 lights each, and the latter by a machine to each lamp; 128 Jablochkoff lights are to be substituted, the same to be supplied by eight Gramme machines of sixteen lights each. This light has also been furnished to the paddle s.s. *Cosmos*, which now has eight lights from a Gramme machine of the new type. (See *Telegraphic Journal* of January 15th, *ante*.) It is also being used at the Usine Centrale de la Cie. Générale de Paris Horologes Pneumatiques, the Ateliers of MM. Jaeggé, Perrard, in Paris, the Usine à Plomb of M. Normand at Nantes, the Magasins de Nouveauté of M. Chauloinneau at Angers, Fabrique de papier of M. Lacroix, Angoulême, Usine du Creusot at Chalon sur Saône, the Theatre Roman at Montpellier, Chantiers of M. Herseux at Brest, likewise at the Filature of M. Eug. Bauer e Soci at Varallo, Italy; the warehouse of Mr. Antill, at Portsmouth, England, and at the Sucrerie of M. Vandesmet at Rio de Janeiro.

THE Under Secretary of State for France has authorised the Ministry des Beaux-Arts to light the forthcoming Salon at Paris with the Jablochkoff light. It will be remembered that the Company lit last year's exhibition with 256 lights, having in the course of seven days and nights supplied steam-power, wires, and sixteen batteries of sixteen lights each. Between the 7th and 30th of the same month that the light was installed, 117,509 persons, each paying his franc, visited the Salon during the evening hours.

IN December last, M. Berly, the engineer of the Société Générale de l'Electricité, conducted a series of experiments to ascertain the best method of supplying the Victoria station at Westminster with electric light from the shed at Charing Cross. He had two circuits, with five lights in each, and first used the up rails as return wires for one, and the down rails for the other. Afterwards he tried one up and one down together for each circuit, with equally good results in each instance. Latterly he has connected the two wire circuits, placing in the centre thereof (at Charing Cross) five lamps, thus making a complete wire circuit of seven miles, with the lamps in the middle of it. The light emitted was apparently of about the same strength as five similar lights on a short circuit.

THE Albion Mills, Halifax, belonging to Messrs. J. Crossley and Sons, are now lighted on trial by the Brush electric light. It is at present applied only to the carding and combing shed, a building with an area of 200 feet by 135, and hitherto lit by 230 gas jets. Fifteen Brush lamps are employed. The Brush light is being tried for lighting purposes at the Liverpool Street Station of the Great Eastern Railway.

THE *Superb*, 8,760 tons, 7,430 h.p., completing for sea at Chatham Dockyard, has been fitted with the electric light apparatus, with which experiments are now being made. The *Swiftsure*, 6,660 tons, 4,913 h.p., at Devonport, and the *Thunderer*, 4,987 tons, 6,270 h.p., at Malta, are also being fitted with apparatus for the electric light.

ELECTRIC LIGHT BATTERY.—Although the production of the electric light by the incandescence of carbon has been pronounced by some scientists wasteful, it is still held in favour by amateur electricians, and the form of lamp devised by Werdermann is now largely used by them. The current for these lamps has generally been generated in a nitric acid battery, such as those of the Grove and Bunsen type, but grave objections have been raised against these on account of the nitrous fumes given off by them whilst in action. To overcome these objections, an amateur has recently devised a cell which may be thus described:—A porous pot is well paraffined top and bottom; into this is put a cylinder of well-amalgamated zinc, which dips into a layer of mercury at the botton, and the cell is filled with acidulated water. The outer pot is charged with strong nitric acid; into this dip four strips of platinum foil attached to a brass ring. Under the ring, but over the foil—pressing it against the sides of the pot—fits a wooden cover saturated with paraffin. Several of those cells are put in a box, into the corners of which are placed unstoppered bottles of ammonia when the battery is in action. It is said that this device prevents all nitrous fumes from escaping.—*Design and Work.*

THE *Scientific American* illustrates an electric lamp patented by the well-known electrical inventor, Mr. Moses G. Farmer, of Newport, R. I. A globe made of glass, and having an air-tight stopper fitted to its lower end, contains a small bar of carbon supported by two large blocks of the same material, mounted on the ends of two bars of metal extending downward through the stopper, and provided with binding posts for receiving the wires from an electrical generator. Two small tubes enter the globe, through the stopper, for the purpose of substituting for the common air contained in the globe a vacuum or an atmosphere of some suitable gas. The small carbon rod offers great resistance to the passage of the electrical current, and is consequently heated to incandescence, and produces a brilliant light without consuming either itself or the gas contained in the globe.

AN excellent article, by Dr. A. Tobler, on the duplex telegraph systems in England has been published in the *Journal Telegraphique*.

MR. HENLEY writes to us to call attention to a slight error in our mention of his new company in the last issue of this journal. The title of the company is "W. T. Henley's Telegraph Works Company, Limited."

THE TELEGRAPH IN JAPAN.—The s.s. *Glenorchy*, which arrived here on the 21st December, brought nearly fifty miles of submarine telegraph cable for the Japanese Government. The greater portion of this is intended for another cable across Tsugar Straits, to connect Hakodate with the main island, and is now being discharged temporarily into the M. B. M. s.s. *Saikio Maru*. The other portion—consisting of nine miles of heavy shore end—will be discharged at Kobe, and is to be employed in laying another cable between No-o-mura in Sikoku and Sibu-kawa, in Bisen, on the main land, a distance of six miles. It will be remembered that a wire was laid last year between the two

places mentioned, by the *Meiji Maru*, but, whether done wilfully, for the purpose of theft, or accidentally from the anchors of junks, faults are continually occurring. It has therefore been decided to lay an extra-strong cable across, which will be too heavy to lift, except with proper apparatus, and the *Meiji Maru* has again been selected for the work. She left for Kobe on December 23rd with the telegraph staff and the necessary gear, in order to complete the needful arrangements, previous to the arrival of the *Glenorchy* at that port. Whilst on this trip, the *Meiji* will also lay an extra wire across Simonosaki Straits.—*The Japan Herald Mail Summary*.

THE number of telegrams received and sent by French offices rose from 3,600,000 in 1868, to over 11 millions in 1878, and last year it must have certainly exceeded 12 millions. The French telegraphic net work had, in 1869, an extent of 113,669 kilometres, and at the end of December last year its extent was 171,500 kilometres.

DIGNEY AND LARTIGUE'S RAILWAY ALARM SIGNAL.—This invention consists of a steam whistle fixed on the engine, and worked by electricity. The whistle is connected with an insulated metallic brush, which is placed under or at the side of the engine. At the side of the line or between the rails there is a fixed metallic contact, about 7 feet long, faced with copper, which is in communication with the positive pole of a battery. The negative pole of the battery is in communication with a commutator on the signal post, from which a wire leads direct to earth. As long as the signal is at "line clear" the passage of the brush over the fixed contact produces no result, but when the signal is set to "danger" the commutator brings the negative pole of the battery in direct communication with earth, and, on the brush passing over, establishes a circuit, and causes the whistle to be sounded. The fixed contact can be fixed any required distance from the signal. This system obviates entirely the danger of running past the signals by reason of fogs, snow-storms, or other causes, and has been adopted with perfect success by the Great Northern Railway of France.

PATENTS FOR INVENTIONS BILL.—In the House of Commons, on Wednesday last, Mr. Anderson moved the second reading of the Patents for Inventions Bill. He said much of the depression in English manufactures, and a great deal of the increasing prosperity of foreign manufactures, was due to the encouragement which foreign nations gave to patentees in comparison with England. Our neighbours sought to stimulate the inventive genius of their people by a cheap system of patent law, while we rather checked such attempts. Every session the amendment of this law was proposed, and the Government introduced bills on the subject, but these bills seemed to create a kind of police to keep patentees in order, and prevent them getting any benefit from their inventions. He would compare our particular manufacturing competitors with England in the charges made in connection with these laws. In Germany, which, after England, charged most, a person could get a patent for a first payment of 30s.; and the subsequent payments up to twelve years made a total of £196 10s. Thus, the heaviest charges were thrown on the latest stages of the working of the patent, the very point on which our Government erred most. In Belgium a patent could be obtained on a first payment of 8s.; a second, three years afterwards, of £4; a third, two years afterwards, of £14, and up to the end of the twelfth year a total of £36 8s. was the entire charge. In America a patent could be obtained for 35 dollars, and that was all it cost for twelve years. In England the initial charge was £12 10s.; at the end of the third year a charge of £62 10s. was made; by the end of the seventh year the patentee had to pay £162 10s., and by the end of the twelfth year £262 10s. The fees were not the only expense to which a patentee was put, for he had to pay endless sums for experiments, and it was absolutely impossible for him to bear heavy charges for fees in the earlier stages of his invention. The bill now before the House proposed a modification of the present charges. It also proposed that paid commissioners should be appointed to manage the Patent Office. That office was at present dreadfully mismanaged. Patentees had the utmost difficulty in ascertaining what previous discoveries there were affecting their inventions. In order to give facilities in this respect he proposed that, in place of the present unpaid commissioners, who did not do the work at all, there should be paid commissioners. The bill also proposed to extend the time during which patents ran, to twenty-one years, instead of fourteen, this provision to apply to existing patents as well as to those which might be granted in the future. He trusted that the House would consent to the second reading of the bill, in order that its principle might be affirmed, as he believed it would stimulate the inventive genius of the country.

After some discussion the order for the second reading was discharged.

We are informed by Mr. Barlow, the well-known patent agent, that Switzerland, which hitherto has had no patent law, has now taken a step in that direction by passing a "trade marks act."

A NEW CABLE.—The s.s. *Calabria*, belonging to the Telegraph Construction and Maintenance Company, sailed on Saturday, Feb. 28, with 511 miles of cable on board, to lay between Manilla and Hong Kong.

Review.

Lightning Conductors, their History, Nature, and Mode of Application. By RICHARD ANDERSON, F.C.S., F.G.S., Member of the Society of Telegraph Engineers. London: E. and F. N. Spon.

(*Continued from page* 70.)

IN France, in the year 1823, a report on Lightning Conductors to the "Académie des Sciences" was drawn up by six of the most eminent electricians of the day. In this report, which contained a large amount of information, the well-known theory that "the upper rod of a lightning conductor—that projecting over the roof—will be an efficient protection against lightning within the circular area of a radius double that of its height" was propounded. This theory seems to have been accepted as such an absolute one, that there is scarcely a book on physics yet published which has not stated it, or has ventured to express any doubt as to its correctness. The acceptance of the truth of this rule, Mr. Anderson points out, "led to the erection of monstrously huge rods made to tower high above buildings, so as to increase the field of protection to the largest possible extent."

The recommendations in the report proved so faulty, that in 1854 a new committee of six were appointed, which drew up a fresh "instruction," in which many of the previous conclusions were re-

vised, and amongst them the theory of the fixed area of protection. It seems strange that the withdrawal of this theory has not been observed by scientific authors; probably this is due to the fact that the theory has been copied from book to book, as it first stood, without each author having taken the trouble to find out whether any change of opinion had taken place in the mean time.

In the 1854 report, the use of copper conductors is strongly urged, as is also the necessity of the joints between the various lengths of rod being well soldered.

A third report was published by the "Académie des Sciences" in 1867. In this report the necessity of a yearly inspection of the lightning conductors was urged with much stress, and it was also strongly recommended that a special report should be made at each examination. The advice has been followed, with the result, says Mr. Anderson, "that at this moment the public buildings of France have the most complete protection against lightning—greatly in contrast with the public buildings in England."

The contrast between the energetic action of the French authorities, and the apathy of those concerned in England is very marked, and were it not for the untiring perseverance of the late Sir William Snow Harris but little would probably have been done during the last half century; as it was, however, lightning conductors came to be extensively adopted on the ships of the Royal Navy, and with the greatest advantage, and also in many cases on buildings, and especially on powder magazines. The present Houses of Parliament are protected by a most efficient system of conductors, designed by Sir William Snow Harris.

In a chapter on "The Best Material for Lightning Conductors," Mr. Anderson strongly recommends, and with reason, copper-wire ropes as being the best protection against lightning; these ropes should be of copper of high conductivity, and this kind is manufactured in large quantities by Messrs. R. S. Newall for the purpose.

The importance of the "earth connection" and the proper way to ensure its being good is fully considered, and a special chapter is devoted to the question of the "inspection of lightning conductors." In speaking of this question the author says, "It is lamentable to think that while the regular inspection of lightning conductors has been admitted long ago to be a necessity in many countries on the continent of Europe, we as yet have taken no steps whatever to realise it." The importance of the subject is thoroughly appreciated by scientific men we should fancy, but the necessity of it has hardly been urged strongly enough, and we fear that until some catastrophe occurs in consequence of neglect of the necessary precautions, no steps will be taken in the matter; but until the time arrives when the nation comes to its senses on the matter, those who feel that they are living in danger of having their dwelling brought down about their ears, either from their residence being provided with a possibly faulty system of protection or from not being provided with any protection at all, cannot do better than purchase a copy of Mr. Anderson's work, which they will find will both interest them and give them practical information, it being the best book on the subject yet published. In conclusion we must say that the "get up" of the work is all that could be wished, being done in Messrs. Spon's well-known excellent style.

Proceedings of Societies.

PHYSICAL SOCIETY.—FEBRUARY 28th.

Professor W. G. ADAMS in the chair.

A PAPER was read by Mr. RIDAUT, on "Some Effects of Vibratory Motion in Fluids." It was found by Savart and Tyndal that jets of water were sensitive to notes or air vibrations like flame, and the author conceived the idea of vibrating the jet of water from within. To do this he caused an electro-magnetic arrangement to pinch the tube conveying the water 400 to 500 times per second, so as to communicate a vibratory motion to the stream of fluid. The issuing jet spread out in two streams, beautifully broken into drops, and representing the fundamental note. When the pinching-lever vibrated irregularly harmonies were observed. When the water was thrown into vibration in two different planes the resulting jet rotated in the tube.

Froude's deduction, that a liquid moving in a tortuous tube has a tendency to straighten the tube, was illustrated by oscillating a pipette with its nozzle.

Professor PERRY explained this action by the hydrodynamical fact, that the pressure is less at the centre of the mouth of the cup than at the edges.

Professor GUTHRIE said that he had tried a similar experiment with a funnel-shaped mouth and a glass cone, but failed. He surmised that perhaps the cohesion of the water for itself, as it formed a shell round the ball, might help to cause the success of the ball method.

Professor ADAMS pointed out that with the cup and ball there was less difference of head of water between the centre of the mouth and the edge where the water escaped than with the funnel.

Dr. STONE stated that he had been able recently to imitate many physiological sounds, such as the murmur of the heart, by means of constructions in tubes through which water and air were flowing. His demonstrations were made before the Royal College of Physicians.

Dr. C. W. WRIGHT then read an important paper on a "Determination of Chemical Affinity in Terms of Electro-motive Force." After giving a history of the subject he described his original experiments. These consisted in performing electrolysis of sulphuric acid, and measuring the heat evolved in the process and by recombustion of the materials. A voltameter with spade-shaped platinum electrodes soldered to stout copper wires, and sealed by a large plug of gutta-percha, was employed for the electrolysis. An ordinary water calorimeter was used to measure the heat given off, as Bunsen's was found to contain sources of loss of heat. The strength of the current employed was varied from 6 webers to $\frac{6}{10}$ weber. The volume of gas produced was measured by Joule's plan. Radiation loss was corrected for by three methods. From an average of eighteen experiments the value of e, the electromotive force, was found to be 1·5038 C. G. S., or volts.

Taking the formula $J = \frac{e}{(H+h)x}$ where J is Joule's equivalent, H is the heat actually evolved, h the heat evolved by recomposition, and x a constant to

which Kohlrausch gives the value of ·000105, the author proves that Joule's equivalent should be $4{\cdot}196 \times 10^7$, instead of $4{\cdot}20 \times 10^7$, as given, to render the formula correct. The author thinks that Joule's water friction experiment gave the truest value of J, and that his electric heating experiments gave a result about ¼ per cent. too low, owing to the B. A. unit of resistance being about 2 per cent. too high, and from other causes.

THE SOCIETY OF TELEGRAPH ENGINEERS.

AT an ordinary general meeting of this Society, held March 10th, Mr. W. H. PREECE, President, in the chair, a paper by Mr. ALEXANDER SIEMENS, on "Recent Improvements in Electric Lighting Apparatus," was read by the SECRETARY.

The preliminary portion of the paper gave a cursory description of the general progress which had been made in electric lighting during the last few years. One of the most important improvements that had been made in dynamo-electric machines, consisted in making one machine act as the excitor to the other machine, the latter giving out the working current; this had been done by Wilde and Ladd.

In 1867, Wheatstone suggested the plan of employing a shunted portion of the current to excite the inducing magnets of the dynamo machine. This device seemed to answer all requirements. The resistances of the armature and the inducing magnets of the machine devised by Wheatstone were high, so that there was no danger of the apparatus becoming damaged by being short-circuited, for when so short-circuited, the inducing magnet became inactive, and thus no current, or very little, would be produced.

Where expense was to be avoided, the use of a separate excitor for the machine was objectionable, as as it was costly.

It was pointed out that a comparatively high resistance in the lead wires caused the lights to burn steadier, as a considerable variation in the arc-resistance produced a less total effect on the total resistance in the circuit.

Alternate current machines were the most economical.

A recent improvement in dynamo machines, effected by Messrs. Siemens, consisted in the abandonment of the iron core on the rotating armature. The effect of this was to very considerably reduce the heating of the wire, and but very little diminution in the effective power of the machine was caused by the alteration.

The progress made in electric lamps could not be considered to be satisfactory. It was a pity that inventors, before bringing out new ideas, did not find out what had been previously done by referring to Major Bolton's list of patents, given in No. 27 of the Society's *Journal of Proceedings*.

Incandescent lamps enclosed in exhausted globes, it was pointed out, dated back to 1845.

Reynier's and Werdermann's lamps were very steady, but not economical, as a great deal of the current was not utilised. The Jablochkoff candle was not quite satisfactory, since if it became extinguished, it did not re-light automatically as the end to end carbon lamps did. The latter form of lamps were the ones most extensively used, and could be made to burn a very long time. New inventions and improvements in lamps were principally in this direction of simplification.

Several lamps had been designed by Messrs. Siemens—viz., the Hefner-Alteneck lamp,* the pendulum lamp,* with the bottom carbon fixed (this form of lamp had been used most successfully at Blackpool); the double solenoid lamp.† Modifications of the foregoing had been made in which the fixed carbon was made movable by being pressed upwards by a spring against a point pressing sideways against the end of the carbon.‡ Good carbons were very essential in order to produce a steady light.

As regards the cost of the light compared with gas, it was stated that, at the Albert Hall, a saving of 60 per cent. was effected; at Blackpool a saving of 54 per cent. Several other calculations were given in which the saving was shown to be from 47 to 87 per cent.; but, at the same time, it was stated that gas companies need be under no apprehension that they would be superseded.

As regards the question of storage of electricity, it was pointed out, that although electricity itself had not yet been stored, yet motive-power had and could be, which practically amounted to the same thing.

In conclusion, Mr. A. SIEMENS stated that the electric light could now be fairly said to be a success.

A vote of thanks having been unanimously accorded to Mr. A. Siemens for his paper, a discussion followed, in which

Mr. CROMPTON explained his improved lamp, which was shown in action, and was remarkable for its steadiness. This result was obtained by the mechanism being made very sensitive and light, so as to respond very quickly to variations of the current. Mr. Crompton stated that he had found it impossible to use the earth in the place of a return wire, on account of its variable resistance.

Mr. HEINRICHS then exhibited and explained his lamp.§

M. ANDRÉ then gave an explanation of his incandescent lamp. The principle of this invention consisted in enclosing the incandescent carbon in a glass globe, which was sealed by means of a water-joint; the air was not exhausted in the globe, but the oxygen of the air was allowed to burn itself out by the combustion of the carbon; when all the oxygen was consumed, then the carbon ceased to burn, and only wasted away very slowly from mechanical disintegration.

Mr. ANDREWS next gave a description of a lamp he had devised, which consisted of carbon plates with their faces parallel and close together. In this case the arc formed between the edges of the plates.

The meeting then adjourned.

New Patents—1880.

814. "Telephone wires or cables." J. H. JOHNSON. (Communicated by F. A. Gower.) Dated Feb. 24.

832. "An improvement in or connected with electric lamps." Honourable R. T. D. BROUGHAM. Dated Feb. 25.

834. "Improved moorings for buoys, specially applicable to buoys used for marking positions in connection with the laying of telegraph cables and with marine surveying." W. C. JOHNSON and S. E. PHILLIPS. Dated Feb. 25.

* *Telegraphic Journal*, Dec. 15th, 1874, page 393.

* *Telegraphic Journal*, Oct. 1st, 1879, page 319.
† " " Dec. 15th, " " 413.
‡ Siemens' single carbon electric lamp, see page 98 of this number.
§ *Telegraphic Journal*, Sept. 15th, 1879, page 301.

842. "Means or apparatus for producing the electric light." A. M. CLARK. (Communicated by Messrs. Bouteilloux and Laing.) Dated Feb. 25.

849. "Improvements in dynamo-electric machines, and in apparatus used therewith." H. J. HADDAN. (Communicated by C. F. Brush.) Dated Feb. 26.

860. "Manufacture of magnetic appliances and garments." G. GREEN. Dated Feb. 27.

872. "Improvements in magneto-electric and dynamo-electric machines, parts of which improvements are applicable also to other purposes." D. G. FITZGERALD. Dated Feb. 28.

878. "Pneumatic telegraph apparatus." W. MORGAN BROWN. (Communicated by Count G. de Monti.) Dated Feb. 28.

885. "Machinery for producing motive power and lights by the means of electricity." J. GRADDON. Dated Feb, 28.

886. "Apparatus for obtaining electricity." C. W. HARRISON. Dated Feb. 28.

899. "Improved combined galvanic batteries and medicated pads for the cure of bodily diseases." A. M. CLARK. (Communicated by H. E. Hunter.) Dated March 1.

905. "Improvements in covering wire with insulating material, and in apparatus for that purpose." J. C. L. LOEFFLER. Dated March 1.

925. "Electric lamp." J. H. GUEST. Dated March 2.

931. "Apparatus for communicating between the passengers in railway trains and the guards or engine drivers." H. MORRIS. Dated March 2.

941. "Improvements in and connected with transmitting and intensifying sound for telephonic purposes." R. H. COURTENAY. Dated March 3.

954. "Improvements in and relating to automatic or mechanical organs and harmoniums, and apparatus or means for playing or performing upon the same and upon pianofortes or other instruments by the aid of electricity, or magnetism, or otherwise." J. T. SMITH. Dated March 4.

ABSTRACTS OF PUBLISHED SPECIFICATIONS, 1879.

2497. "Transmitters for telephones." ALEXANDER MARR. Dated June 21. 4d. Instead of vibrating diaphragms of thin sheets of metal with solid or powdered carbon between, the inventor uses diaphragms made of wood, preferably pine, inside which diaphragms and near the centre, he attaches a disc or discs of solid carbon in close proximity to each other, or he fills the space between two wooden diaphragms with powdered carbon.

2654. "Telegraphic apparatus." E. COOPER WARBURTON and LOUIS JOHN CROSSLEY. Dated July 1. 6d. Relates to a relay for use with Bright's bell instruments, and to polarised telegraphic relays generally. *See* p. 96.

2656. "Immersing submarine cables." AUGUST BLONDOT and JULES BOURDIN. Dated July 1st. 6d. Is intended to facilitate the laying of cables, so that there may be no kinks and no great strain between the submerged part and the remainder of the cable. The cable is wound with regularity on a drum, to which the movement for unwinding is given by gear which is capable of varying the speed. At the stern of the vessel is a pair of delivery rollers with a caoutchouc surface, and driven by a shaft of the drum with the aid of two intermediate devices, viz.:—First, a round strap which passes over the drum, and has an independent tightening device; and, secondly, a brake analogous to those employed to obtain a regular tension of the thread in a sewing machine.

2674. "Telephones." SYDNEY PITT. Dated July 2. 1s. 4d. (A communication from abroad, by George Lee Anders, of Boston, U.S.A.) Consists in a district telephone system of a series of switches, each of which normally short-circuits the telephonic apparatus, and is adapted to establish an earth connection at each station on either side, according to the direction of the communication, without breaking the continuity of the line. Also to enable a bell to be rung at one of the several stations on an electrical circuit at the will of the operator, at the station from which the signal is given, without ringing the bell at any of the other stations.

2697. "Indicating in railway carriages the names of stations, &c." F. M. ROGERS. Dated July 3. 2d. Consists of a dial with pointer, or a drum or roller, upon which the names of the station, or the numbers expressing the names of the stations, are made apparent. By means of a permanent or polarised electro-magnet a wheel or detent attached to the pointer or drum is caused to move forward or backward one step when a current is sent through the wire connecting the various indicators with the guard's van, in which is placed an ordinary key or automatic current sender, so arranged as to actuate the indicator when entering a station.

3001. "Insulated wires and cables." WALKER MOSELEY. Dated July 23. 2d. Proposes to surround the wire or cable with twisted strands of horsehair, then to saturate the whole with melted resin or gum, with a little oil to toughen it. Afterwards to enclose it in a double sheathing of copper or other metal, with tin or composition between the double sheath. (*Provisional only.*)

3023. "Telegraph wires." J. H. JOHNSON. Dated July 25. 4d. (A communication from Eldridge Wheeler, of Pa., U.S.A.) Consists of a telegraph wire with a core of steel, Bessemer steel or homogeneous iron, and a clothing of wrought iron welded to the steel, the advantages claimed being great strength and cheapness compared with wires in common use.

City Notes.

Old Broad Street, March 11th, 1880.

TELEGRAPH CONSTRUCTION AND MAINTENANCE CO.—The ordinary meeting of this Company was held on the 2nd inst., at the Cannon Street Hotel, Sir Daniel Gooch, Bart., M.P., the chairman, presiding. The secretary (Mr. W. Shuter) read the notice. The chairman said: In moving that the accounts and the report be adopted, I need not detain you very long, because the affairs of the Company are set out fully in the report, which I have no doubt you have all read. You will see that during the past year we have manufactured 6,917 miles of cable. The result in money is that we show a net profit of £98,988, after deducting interest charged upon our debentures. We brought forward from the previous year an amount of £59,353, making together £158,341 to dispose of. Out of this we gave an interim dividend of 5 per cent. in July, amounting to £22,410; and now the directors propose to distribute, as dividend, 15 per cent. for the last half-year, £67,230, carrying forward to next year £68,701.

That, I think, gentlemen, is a very satisfactory statement of the financial working of the past year. (Hear, hear.) The work done is set out in Paragraph A. First, the duplicate Australian cable, which we began very early in the year, but the completion of which was postponed in consequence of the necessity that occurred for carrying out the Cape contract. The Australian Government were good enough to postpone the completion of this cable in order that the Australian cable might be utilised towards completing the Cape cable. Therefore we did not complete the Australian cable till within the current year almost. Then Paragraph B refers to the Cape cable, and you will see that 3,845 miles were successfully laid; but, unfortunately, a break has taken place since in the shore near Mozambique, and there was no ship nearer than Aden for the purpose of repairing it; but we have information to-day that the ship has arrived on the ground, and I have no doubt in a day or so the cable will be made right. It is a bad bit of ground where the cable has broken, and some means will have to be taken by the Cape Cable Company to see if they cannot find a better piece of ground outside the existing route. Then we have started a ship, the *Calabria*, with 555 miles of cable to be laid between a point near Manilla, in the Island of Luzon, and Hong-Kong, and that will be completed in the month of May, that is for the Eastern Extension Company. Then we have carried out a contract with the German-Norwegian Company to make and lay a cable between Arendal, in Norway, and Hoyer, on the coast of Schleswig, and this operation was completed in August, amounting to 256 miles. Then, in December last, we entered into a contract for a short cable for the New Zealand Government of about 120 miles, and the cable is now laid and the ship is on her way home. The total amount of cables made has been 6,917 miles. We are, I think, indebted to those officers and others who have been engaged in laying these cables, for the care and ability with which they have completed their work. It is a very large extent of cable to lay, and we have had no misfortune of any kind to record. Of course the accounts are set out in their full detail, I shall be glad to give any explanation of them, but I do not know that I can do any good by repeating them. You have them in the paper before you much clearer than my explanation would be. I don't know that I can say more than that we hope our present prosperity may continue. Perhaps it will not be quite so great as it has been; but, at any rate, so far as your directors are concerned, they will do their best to carry on the work satisfactorily. The chairman concluded by reading the formal resolution for the adoption of the report and the declaration of the dividend. Mr. Philip Rawson seconded the motion. In answer to Mr. Abbott, the chairman said: Mr. Abbott is not quite right in supposing we have laid 6,617 miles of cable during the year. That was the quantity manufactured, but the whole of it was not laid in the year. The Australian cable was not laid within the year, and the accounts of the Australian cable do not come into this account at all. I mentioned that before, but perhaps Mr. Abbott did not catch what I said. As I have told the shareholders on many occasions, the success of this Company hitherto has been due to the fact that we have large funds in hand. If we had not had large funds in hand we could not have laid the Cape cable. It is pretty well publicly known that the Telegraph Construction Company had to take two-thirds of the capital of that cable upon its own hands, and the Eastern Company took the other. If we had not had these large available amounts at our command we never could have undertaken it; therefore, although they look large sums to keep in hand, yet our success depends upon having large sums in hand. Of course I am as deeply interested as others in getting large dividends. I want them very badly, like everybody else; but I look to the prosperity of the concern, not for one year, but as a permanent investment, and I am sure the course we take is the wisest course, and it has hitherto been the successful course. I don't think anybody can complain of 20 per cent. I wish I had that in everything I am connected with. Therefore I hope the shareholders will not inquire too closely into the figures of that account, but will trust the directors, who have never yet deceived them, and who, if times become hard, will tell them of it. I do not propose to give the details of our securities. They are shown generally in the state of the balances, and I hope the shareholders will accept them in that shape. The report was then adopted unanimously.

MEDITERRANEAN EXTENSION TELEGRAPH CO.—The half-yearly general meeting was held on the 3rd inst. at the City Terminus Hotel; Sir James Carmichael in the chair. The secretary read the advertisement convening the meeting, and the report of the directors was taken as read. It stated that the last half-yearly balance sheet of the Company showed a slight improvement over that of the previous half-year. The cables were in good condition. They recommended payment of the usual dividend at the rate of 8 per cent. per annum, less income-tax, on the Preference Stock, and of a dividend at the rate of 3 per cent. per annum, free of income-tax, on the Ordinary Stock of the Company, on and after the 10th March, leaving a balance of £48 to be carried to the reserve fund. The revenue account showed that the receipts from messages during the half-year ending the 31st of December last had been £2,281, and the amount due from the Government under the guarantee was £3,600. The chairman, in moving its adoption, regretted the delay which had occurred in holding the meeting, and said it had arisen through the official auditor of the Treasury demurring to a portion of their claim for payment of the guarantee. They had tried to get the matter settled before the meeting, but it was still under the consideration of the Treasury. He hoped, however, that at their next meeting he should be able to make a favourable report on the subject. The motion having been seconded, Mr. Robinson thought the shareholders should remonstrate with the Government, who, he said, were imposing very onerous terms on the Company, and seemed to dictate to the board what they should do and what they should not do. Seeing the difficulty they now had in getting messages from the Government, he supposed that when the guarantee expired they would get none at all. The shareholders took no heed of the position of the Company, but imagined that the dividends they were receiving were to be continued for ever. Looking at their prospects, he thought they should add to the articles of association a power enabling them to grasp some other line or to make an arrangement with some other company. The chairman, in reply, said the agreement with the Government had nearly four years to run. Seeing that the Government could end the guarantee, it was surely not their interest to quarrel with their paymaster. The Government had paid them fairly and liberally, and he had not found them hard taskmasters. The present Government was not answerable for having sanctioned the competing line referred to by Mr. Robinson. Mr. Campbell (the solicitor of the Company) said he hoped they would be able to come to an amicable arrangement with the Government on the point at issue. The chairman thought Mr. Robinson had made a valuable suggestion, and it was arranged that if anything occurred which was likely to affect the Company beneficially they might call a meet-

ing before the next half-yearly meeting, but if not the next meeting could be made special to take the powers suggested. The report was unanimously adopted and the dividends recommended were declared.

THE DIRECT UNITED STATES CABLE COMPANY (LIMITED).—Report of the proceedings at the fifth ordinary general meeting of the Direct United States Cable Company (Limited), held at the City Terminus Hotel, Cannon-street, on Friday, 27th February, 1880, at twelve o'clock, noon; John Pender, Esq., M.P., in the chair. The notice convening the meeting was read. The Chairman: Gentlemen, as you have had the report in your hands for some days, I presume you will take that as read. I should like in the first instance to make a few remarks as to the figures in the report, in order, if possible, to make it so clear that there may be no difficulty in discussing it on its merits. It will be seen from the Company's accounts that our revenue for the half-year to 31st December last, after deducting rent of land lines and payment to Anglo Company, amounted to £120,445 8s. 6d.; and the working and other expenses, including debenture interest and income-tax, absorb £25,001 3s. 6d., leaving a balance of £95,444 5s. as the net profit of the half-year, making, with £2,345 1s. 5d. brought from the previous half-year, a total of £97,789 6s. 5d., which has been appropriated as follows:—Two interim dividends of 5s. each per share for the quarters ended the 30th September, and 31st December, 1879, together requiring £30,355, have been paid; an amount of £48,942 2s. 9d. has been added to the reserve fund (which is thereby increased to £150,000); the sums of £1,900 on Preliminary Liquidation and Arbitration Account, and £914 7s. 1d., the cost of removing spare cable, have been written off, and the balance of £15,677 16s. 7d. is carried forward to the next half-year. Our revenue in the past half-year, as compared with that in the corresponding period of 1878, has increased by the sum of £30,501 13s. 10d. This satisfactory result is mainly owing to the revival of trade between this country and America. The working and other expenses show a balance of increase of £3,250, which is accounted for as follows:—Compromise of Colgate suit, including law and other charges incidental thereto, £2,560. I think it is right I should explain to you that this Colgate suit is the reversion of an old patent which was obtained in America, and a claim in respect of royalty upon the covering of copper wire with gutta percha. That patent existed in this country, but expired many years ago. The American patent in some way or other had been in existence at a later date, and, curiously enough, the inventor, or rather, the trustee of the inventor, took the question up and gained a decision in more courts than one in America. Therefore, that involved a compromise; but, fortunately for us, we got out of the matter by that compromise at a comparatively small expense. I believe that the trustee of the inventor in America has got a very large sum of money from land lines in America in virtue of that patent. Then there is the opening and furnishing new stations in America and building in Ireland, £830; extra printing and stationery, £410; maintenance and renewal of instruments, £360; debenture issue and miscellaneous, £720; making a total of £4,880. But, as against this increase, there are many items of decrease, amounting to £1,630, leaving as net increase of expenditure £3,250. Omitting from these details the special expenditure *re* Colgate, it will be seen that the other items of increase were unavoidable, inasmuch as without the extra outlay it would have been impossible to earn the largely increased revenue. The above explanation of the increase in our expenditure, &c., having been given, no other item in the accounts appears to call for special remark. (Applause.) Now, gentlemen, I hope I have put before you very clearly the state of our finances, and I think I may congratulate the shareholders on their very satisfactory character. Therefore I need trouble you no further with these details. No doubt there are gentlemen in the room who may require to ask some questions on those accounts. If so, I shall be very glad to reply to any criticisms that may be made upon them. I may also congratulate you on the fact that since April last our cables have been working in every way satisfactorily, and the result has been the large return which your accounts show. I have no doubt that there are many gentlemen present who will be naturally anxious to know how we stand in relation to the new French cable. (Hear, hear.) It may be in your recollection that six months ago I gave you an outline of the French competing scheme. Since then the line has been completed, but I can scarcely say yet that it is open for general traffic. Messages have passed over the line, but at the present moment the telegraphing public know very little about it, and I suspect those who are immediately interested in the cable know a great deal more than it would be pleasant for them to communicate. So far they are very much in the position which I indicated—they are doing no good for themselves, but they are inflicting damage to a very considerable amount on telegraphy generally. I also stated six months ago, when those shares were at a premium in France, that in my opinion before twelve months were over they would be at 50 per cent. discount. I saw those gentlemen who formed the syndicate, for I went to Paris for the purpose of doing so, because I thought it was only right that those men, who must be ignorant of telegraphy generally, should be informed on the subject. I found one of them sitting at his desk with his pen in his hand, and I told him to make this note—that in twelve months, if I then returned to France, I should be able to sympathise with him on the loss of 50 per cent. of his property. To-day I can prove the truth of the prediction, for I now hold in my hand an official quotation from France, made only yesterday, which states that the shares have been sold at £11 each, which is close upon 50 per cent. discount. We may infer, therefore, gentlemen, that the cable manufacturers, the syndicate, and the French public generally, are in no way satisfied with their bargain. The contractors have pretty well exhausted England, as you who formed this Direct Company know. For three years the shareholders got nothing out of this Direct Company; and the syndicate lost £550,000. I have no doubt at all that if the new French cable were to fall into better hands, those better hands would probably by business-like arrangements be able to bring about the same result which has been brought about on our system; but then, gentlemen, it will be at a loss of about 50 per cent. on the original cost of the cable. As I have said they have exhausted England, I may say that they have pretty well exhausted France by this time also; and we are informed that they next propose to try Belgium, and, if that fails, Germany. But I should say that after the two attempts which have been made by the same parties, in which they have so signally failed in carrying out the promises made in their prospectuses they will find out that other countries are not likely, particularly Germany, to engage in such a losing game. Schemes, such as the French cable scheme, are got up, as you are aware, by contractors and syndicates simply for the purpose of getting money upon the transaction, regardless of all consequences to telegraphy or to the investing public. Within a year they may get up a company, and within a year they may lay the cable, and hand it over to the company;

the public lose their money, the contractor probably puts something into his pocket, unless he has taken the amount of his contract in shares, and the result is that he goes elsewhere to find out another field for his enterprise. When telegraphic enterprise was first started, syndicates were a necessity, as it was almost impossible to get money from the general public; but now that telegraphy is established as a commercial necessity, and its real value ascertained, the public are not likely to subscribe for any enterprise unless they see a return commensurate with the risk. I have always held at public meetings of telegraph companies which I have had the honour of addressing that submarine telegraphy ought to pay from 8 to 10 per cent. dividend. I hold the same opinion now. It is a very curious fact, if you look at the telegraph companies generally, that the public estimate and value the telegraphic enterprises pretty much at that rate. No doubt in the early days of telegraphy 10 per cent. was necessary; but now that the public estimate the value of the telegraphs more accurately, and consider them more secure as a property, the returns are less. I may say that the telegraph returns upon the price which you can buy them at to-day give something like from 6 to 8 per cent. The amount of money at present invested in cables is about £25,000,000; the amount of reserve fund put aside by all the telegraph companies amounts to £1,630,000; but to replace the deep sea portions of these cables, an amount of £12,500,000 would be required, and until this amount is obtained, it would not be wise, in my opinion, to consider submarine telegraphy in the sound position in which its friends would wish it to be placed. On this point I think it necessary to be very clear and distinct, so that there may be no misunderstanding betwixt shareholders and directors. The Direct Company's cable has been laid nearly six years; for three years, as you are aware, it paid no dividend, and put aside no reserve. It has been nearly three years under the present direction, and in that time we have paid you a dividend of 5 per cent., and have accumalated an amount of £150,000 for a reserve. Had the proper course been pursued from the beginning, and a proper reserve laid aside, we should have at the present time £300,000 as a reserve fund. The average life of a cable is said to be ten years, but as to this, much depends upon the bed on which the cable is laid. I believe it would be difficult, if not impossible, to raise a cable from 2,000 fathoms after being ten years under water; still, it is quite possible that a deep-sea cable might live for twenty, thirty, or forty years, or even longer, so far as the insulated core is concerned, because in all our raisings of cables that have been in the sea for a very considerable time, we find that the gutta percha is almost indestructible, as far as sea water is concerned. As that is the life and heart of a cable, if you could only get armour-plating sufficiently strong to resist the action of the sea water, a telegraph cable, might live for a very long period. However, let us assume the life at ten years. The reserve necessary to replace the deep-sea portion of our cable in that time would be £52,300 per annum, but if we raise the life to fifteen years, we should require £32,300 per annum. I think, gentlemen, the safer principle to go upon is to put aside the larger sum, and when we exceed the ten years, and our cable is still living and in a profitable working state, then the Company can afford to pay a very considerably increased dividend, or probably it would be better to give bonuses. I submit, therefore, that the policy, not only of this Board, but the policy of all Boards of submarine telegraph companies, should be to accumulate a large reserve. There is another point I must touch upon, and that is the often-expressed desire in certain quarters for reduced telegraph rates. Now I think I have shown you that a reserve fund is a necessity to secure permanency of telegraph property, I think I can now show you that the reduction of rates from the commencement of telegraphy has been very striking indeed. When the telegraph was first established, the tariff across the Atlantic was £20 a message; it has gone down steadily, and now an average message costs 30s., in fact, a message can be sent across the Atlantic for 9s. When we reflect upon the ingenuity of the code and packing systems, we find that the amount of matter that can be transmitted at this low rate is almost beyond calculation. I may repeat what I have often stated at these meetings—if we had now an open system instead of the code system to deal with, for the matter which is passed over our lines we should realise the most sanguine anticipations entertained in the early days of telegraph property as to dividend. I remember myself, in the very early days of telegraphy, talking with Mr. Cyrus Field, and his saying that nothing less that 50 per cent. would satisfy him as a proper return for these telegraphic cables. That was a very sanguine view; but, if the open system had been continued to-day, it would have proved pretty much what he stated. But the ingenuity of the coding and packing system has reduced us, as I will show you, to a very low dividend indeed. It is the public who have really got all the benefit of the telegraph. If we take the capital of all submarine cable companies at the present moment, we find that the amount is over twenty-five millions sterling, and taking all the dividends that are earned upon these twenty-five millions, we find it to come out at only 4¼ per cent. It would, therefore, I hold, be unsound policy, both in the interests of shareholders and of the telegraphing public, to talk of reducing rates at the present moment. We must remember that a submarine cable can only carry a certain number of words, and, taking the working time of a cable, it requires 3s. a word to give but a very moderate return upon the invested capital in these Atlantic systems. So far as the Atlantic tariff is concerned, any reduction leading to an increase of messages would not lead to a larger return in money, because at a low rate it would be impossible for a cable to carry the number of words required to make it pay. To carry messages at a low rate, additional cables would be required, which, of course, involves additional outlay of capital and reduction of dividends. The present tariffs are in no way checking telegraphy, as we may plainly see, if we take last year as an evidence, for there is a large increase in the return of telegraphs generally. As I have often said, telegraphy is the best barometer we have of trade. With good trade, the returns rise rapidly. With bad trade, they become correspondingly depressed. The increase in the telegraph companies' returns is one evidence which I think we have all good reason to congratulate ourselves upon at the present moment, that not only in America, but also in India, and, in fact, throughout the world, trade is getting into a brighter and sounder position; and that is an evidence which I believe will brighten many a home. (Hear, hear.) We must deal in this question of telegraph tariffs with averages, and I hold that the rates we are now charging are a fair average, and must be maintained until the reserves I have indicated are secured. Having now shown you by figures that it is desirable to largely increase the reserves, and that it is undesirable and impolitic to reduce tariffs, I will just say one word as to the position which submarine telegraphy occupies at the present moment, and what it has had to contend with. Telegraphy has had little or no support from governments. Governments have never hesitated to grant concessions to anybody who might apply for them,

encouraging, as they say, competition. They even go so far as to prevent any cable landing upon their shores (I am speaking of England, France, and the United States) which hold any concession or special privileges, while they do this, throwing every obstacle in their power in the way of submarine telegraphy (and I should be glad to have an opportunity of proving this to the governments) becoming a remunerative enterprise, although they admit it has become a great necessity both for Imperial and commercial interests. But instead of dealing with it on the same principle that they deal with their own telegraph systems, which in every country is a vast and close monopoly, they are strict to a degree in upholding their own monopoly, but they lose no opportunity of destroying what they are pleased to term the monopoly of submarine telegraphy. I hope the governments will see these things in their proper light, and that they will consider well when concessions are asked for whether they are sought in the interests of the public generally, or are meant to enrich speculative contractors, to the destruction of sound telegraph enterprise. Telegraphy does not admit of undue competition. It has had to be established at enormous cost, and is of a very speculative and uncertain nature. Until science has done more than it has yet done to render cables permanent, the greatest caution ought to be observed on the part of governments, and I may say also on the part of individuals, in order not to destroy the fabric which has done so much, not only to promote commercial interests, but civilisation, to a degree more rapid than anything that has yet been known in this or any other time in the history of the world (Applause.) Gentlemen, I have felt it necessary to-day to give you a few details, which I dare say will be interesting to you, as showing the position in which telegraphy is at the present moment. I believe that the value and usefulness of telegraphy is only beginning to be felt at the present moment. Great as the benefits are which it has conferred upon mankind, there are still greater benefits to be conferred by it; and I think that all those who have been interested in telegraph enterprise from the beginning may congratulate themselves upon the fact that they not only have had a moderate dividend, but they also have the satisfaction of knowing that their property is an increasing property, and that they have conferred an enormous benefit upon the commercial interest and the public generally. (Hear, hear, and applause.) Gentlemen, having troubled you with these few remarks, I beg to move the following resolution:—"That the report of the directors, dated 13th February, 1880, together with the statement of accounts to the 31st December, 1879, annexed thereto, be, and the same are, hereby received and adopted." Mr. W. Ford seconded the resolution. Replying to Mr Jackson and Mr. Newton, the Chairman said: Mr. Jackson has entirely endorsed the policy of the Board. He has asked the Board to stand on that policy; but he has stated that so far as our cable is concerned, we are in a very uncertain and very unsatisfactory position. I do not agree with Mr. Jackson in that respect, because our arrangements with the Anglo-American Company are of a very satisfactory nature. We should have ample time to repair our cable if it were to break, without suffering in any way in our dividends. At the same time, were it to break in deep water, there is no doubt at all that we should require to find a new cable. Our cable is still young and healthy, and I think it is in that position which, if it were to break to-morrow, as we have got a very good nest-egg to begin with, and plenty of time to repair it, and sufficient shallow water, that would limit the amount required for the cable to a very small proportion indeed. I take, therefore, a much livelier and brighter view of our position, so far as our own cable company is concerned, than Mr. Jackson does. We are, certainly, the junior partner; but we are supported by all the means and all the powers of the Anglo Company with regard to help in case of need. I do not go in for monopoly: I have always been opposed to monopoly. When we extricated this Company from its troubles, we were most decided in that view; we felt that to be absorbed by the Anglo Company was simply giving place for another cable to spring up. As long as I have the honour of being chairman of this Company, it will never be considered a monopoly, as I am opposed to monopolies altogether. I say that submarine telegraphy is a matter of enterprise, and is not ground to be poached upon by any other class of property. It is an uncertain property, as we all know, and that man who came forward to induce other people to find money to lay cables where they could get a better security for half the price at the same moment, shows that the public are still what I will call very gullible indeed, but I hope that every day is opening their eyes in that respect. With reference to Mr. Newton's question, I was going to make the reply which Lord Monck did, which I think was a very sound and proper reply. Only last night, in the House of Commons, a question was put to one of the ministers, and the minister's reply was, "During negotiations it would not be to the public interest that anything should be said about it." During the present stage of negotiations between the French and English companies, I think the less said about it the better. (Hear, hear.) All I can say is, that they are doing nothing, and, with a large capital lying unemployed, every day is strengthening our position and weakening theirs. You may depend upon it, when it comes to close quarters, if a bargain is ever made, that the interests of the shareholders of this Company will be fairly protected. The resolution was then put and carried unanimously. A vote of thanks having been accorded the Chairman, the proceedings then terminated.

The following are the final quotations of telegraphs:—Anglo-American, Limited, 59¾-60¼; Ditto, Preferred, 88-89; Ditto, Deferred, 32¼-32¾; Brazilian Submarine, Limited, 7⅞-8; Cuba, Limited, 8¼-9¼; Cuba, Limited, 10 per cent. Preference, 16-16½; Direct Spanish, Limited, 2-2½; Direct Spanish, 10 per cent. Preference, 10¾-11¼; Direct United States Cable, Limited, 1877, 11-11½; Scrip of Debentures, 100-102; Ditto, £25 paid, 1-3 pm.; Eastern, Limited, 8¾-9¼; Eastern 6 per cent. Preference, 12-12½; Eastern, 6 per cent. Debentures, repayable October, 1883, 103-106; Eastern 5 per cent. Debentures, repayable August, 1878, 101-103; Eastern, 5 per cent., repayable Aug., 1899, 101-103; Eastern Extension, Australasian and China, Limited, 8¾-9⅛; Eastern Extension, 6 per cent. Debenture, repayable February, 1891, 105-108; 5 per cent. Australian Gov. Subsidy Deb. Scrip, 1900, 100-102; Ditto, registered, repayable 1900, 101-103; German Union Telegraph and Trust, 8½-9; Globe Telegraph and Trust, Limited, 5½-5¾; Globe, 6 per cent. Preference, 11¼-11⅝; Great Northern, 9⅛-9⅜; Indo-European, Limited, 24-26; Mediterranean Extension, Limited, 3-3½; Mediterranean Extension, 8 per cent. Preference, 10¾-11¼; Reuter's Limited, 10-11; Submarine, 230-240; Submarine Scrip, 2-2½; West Coast of America, Limited, 1½-2½; West India and Panama, Limited, 1⅝-1¾; Ditto, 6 per cent. First Preference, 7¼-8; Ditto, ditto, Second Preference, 7-7½; Western and Brazilian, Limited, 7-7½; Ditto, 6 per cent. Debentures "A," 98-101, Ditto, ditto, ditto, "B," 97-100; Western Union of U.S. 7 per cent., 1 Mortgage (Building) Bonds, 120-125; Ditto, 6 per cent. Sterling Bonds, 102-104; Telegraph Construction and Maintenance, Limited, 34-35; Ditto, 6 per cent. Bonds, 104-108; Ditto, Second Bonus Trust Certificates, 2⅞-3⅛; India Rubber Co., 13½-14; Ditto, 6 per cent. Debenture, 106-108.